

SECTION 704 SIGNING MATERIALS

704.01 MATERIAL FOR SIGNS.

704.01.1 Sheet Aluminum. Use aluminum alloy meeting the Aluminum Association alloy AA5052-H38 or AA6061-T6 requirements. Meet the sheet thickness requirements in Table 704-1.

**TABLE 704-1
SINGLE POST CENTERLINE MOUNTING
WITHOUT BACK BRACING**

REGULATORY SERIES	
Sign Size	Metal Thickness
0" to 33" inclusive (0 to 838 mm)	0.080 in (2 mm)
34" to 41" inclusive (864 to 1,041 mm)	0.100 in (2.54 mm)
42" to 51" inclusive (1,067 to 1,295 mm)	0.125 in (3.17 mm)
WARNING SERIES	
30 X 30 in or smaller (762 X 762 mm)	0.080 in (2 mm)
36 X 36 in (914 X 914 mm)	0.080 in (2 mm)
48 X 48 in ((1,219 X 1,219 mm)	0.100 in (2.54 mm)
60 X 60 in (1,524 X 1,524 mm)	0.125 in (3.17 mm)
ALL SIGNS WITH BACK BRACING	
Maximum Back Brace Spacing	Sign Sheet Thickness
< or = 32 in. (813 mm)	0.080 in. (2 mm)
< or = 40 in. (1,016 mm)	0.100 in. (2.54 mm)
< or = 50 in (1,270 mm)	0.125 in. (3.17 mm)
DELINEATOR REFLECTORS	
All sizes	0.063 in (1.6 mm)

Use the sheet thickness shown in the regulatory series for the route marker series, using the widest point on the cut-out shield for the width dimension.

704.01.2 Aluminum Sheet Increment. Construct Aluminum sheet increment signs using AA5052-H38 or AA 6061-T6 sheet aluminum (thickness in Table 704-1) fastened to an extruded T-section (AA6063-T6) backbrace with 3/16-inch (5 mm) blind rivets. Use the backbrace and rivet spacing shown in the Detailed Drawings. Use extruded T-sections weighing a minimum 0.88 lbs/linear foot (1.3 kg /m) with a minimum moment of inertia about the neutral axis of 0.40 inches⁴ (166.5 mm⁴).

704.01.3 Plywood. Use Douglas Fir meeting the "Commercial Standard 45 for Douglas Fir plywood", B-B high density overlay, 60/60 with plastic overlay, both sides, 3/4-inch (20 mm) thick. Do not use plywood on multiple post installations.

704.01.4 Aluminum and Steel Posts.

A. General. Furnish posts meeting the Contract requirements. Treat steel post field cuts and holes with one coat of metal primer and two coats of aluminum paint. Coat galvanized posts meeting AASHTO M 111 specifications.

B. Steel Posts.

1. Structural Steel. Furnish structural steel posts with a nominal weight exceeding 3 pounds per foot (4.5 kg/m) meeting ASTM A 36 requirements. Bid these posts as "steel structural sign posts".

2. Steel U Sign Posts. Furnish steel posts formed into a "flying U" shape with a nominal weight exceeding 3 pounds per foot (4.5 kg/m) meeting AASHTO M 281. Bid these posts as "steel U sign posts".

3. Tubular Steel Posts. Furnish round tubular steel posts meeting ASTM A 53 Type E or S, Grade B requirements. Furnish square or rectangular tube posts meeting ASTM A 500 or 501 requirements. Painted or galvanized posts are acceptable. Meet ASTM A 123 requirements for galvanizing. Paint posts with a paint meeting Subsection 710.02 (B)(3) requirements. Paint the posts meeting the applicable requirements of Section 612.

4. Square Tubular Steel Posts. Furnish square tubular steel sign posts, anchor posts, anchor sleeves, and splice sleeves meeting one of the following requirements as specified in the Contract:

a. ASTM A-446 Grade A, steel in 10 or 12 gauge having a 33,000 psi (22.7 MPa) minimum yield strength and a 45,000 psi (31 MPa) minimum tensile strength.

b. ASTM A-570, steel in 12 or 14 gauge having a 60,000 psi (41.4 MPa) minimum yield strength and a 75,000 (51.7 MPa) minimum tensile strength.

Use ASTM-A 307 Grade 2 bolts and nuts. The sign posts, sleeves, anchor posts, auxiliary fittings and anchor sleeves must have 7/16-inch (11 mm) diameter holes or knockouts on 1-inch (25 mm) centers on all four sides.

The permissible pole straightness variation is 1/16-inch in 3 feet (1 mm per m) with the corner radius being 5/32-inch (4 mm) plus or minus 1/64-inch (0.4 mm).

C. Coatings. Coat the post with Type 2 aluminum paint at a minimum 0.75 ounces per square foot (228 kg per m²) of surface area, measured by triple

spot testing under AASHTO T-213. Follow with a chromate conversion coating, and a thin acrylic or polymer resin film; or a triple coating of hot dipped zinc weighing 0.60 ± 0.15 ounces per square foot ($183 \text{ kg} \pm 4.3 \text{ kg per m}^2$) meeting AASHTO M-120, followed by a chromate conversion coating 15 ± 5 micrograms per square inch (645 mm^2), and a clear organic coating 0.2 ± 0.1 mils ($0.005 \text{ mm} \pm 0.0025 \text{ mm}$) thick on the outside surface. Provide double in-line application of a full zinc-based organic coating 1.2 ± 0.6 mils ($0.003 \text{ mm} \pm 0.0015 \text{ mm}$) thick tested under ASTM B-117 on the inside surface.

- D. Aluminum U Posts.** Furnish aluminum posts made of AA6061-T6 alloy extruded to a U channel meeting ASTM B 209.

704.01.5 Treated Timber Posts. Furnish treated timber posts of construction grade, S4S, full length pressure treated with a 5% by weight pentachlorophenol solution or Chromate Copper Arsenate (CCA), Type B or C, or Ammoniacal Copper Arsenate (ACA) meeting AWPA standards and Subsection 706.04.1. Perform all cutting, trimming and boring, excluding the breakaway hole, before treatment. Assure individual posts are uniform in color for each project. The posts will be inspected where treated.

Treat injuries, cuts, and holes in posts after treatment with 3 applications of copper naphthenate solution containing a minimum 2% copper metal or with Chromate Copper Arsenate (CCA) meeting AWPA M4 requirements.

704.01.6 Treated Timber Poles. Furnish treated timber poles meeting ANSI Specification 05.1 and of the species listed in Table 4, 5, or 6. All poles on each project must be the same species and uniform in color after treatment. Machine-peel and full length pressure treat all posts with a 5% by weight pentachlorophenol solution or CCA (type B or C), or ACA as specified in Subsection 706.04.1. Gain each pole on the sign face as specified. Poles may be gained full-length, or half gained from the top.

Use pressure treated, construction grade, 2 X 4 (50 X 105 mm) in S4S for back bracing.

Treat poles, damaged, cut, or bored after treatment meeting Subsection 704.01.5 requirements.

704.01.7 Barn Poles. Barn poles are specified by the top diameter. Meet the following table top diameter limits:

Specified Top Diameter	Limits (diameter)	
	Min.	Max.
3" top (75 mm)	3" (75 mm)	< 4" (100 mm)
4" top (100 mm)	4" (100 mm)	< 5" (130 mm)
5" top (130 mm)	5" (130 mm)	< 6" (150 mm)
6" top (150 mm)	6" (150 mm)	< 7" (180 mm)

Furnish poles that are straight so that a line from center of tip to center of butt passes through the pole body from tip to butt. The poles must be free of crooks and

sweeps. Full length pressure treat all barn poles with a 5% by weight pentachlorophenol solution or Chromate Copper Arsenate (CCA), type B or C, or Ammoniacal Copper Arsenate (ACA) meeting AWPA standards and Section 706.04.1 requirements.

Treat damaged, cut, or bored holes in treated posts meeting Subsection 704.01.5 requirements. Gain each pole on the sign face at least 2-inches (50 mm) in width as specified. The post may be gained full length or half-gained from the top.

Use pressure treated, construction grade 2-inch X 4-inch (50 X 105 mm) in S4S for backbracing.

704.01.8 Overhead Structures. Furnish overhead sign structures meeting the current AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals and the Contract requirements.

704.01.9 Concrete. Use class "A" or "D" concrete meeting Section 551 requirements for steel sign post foundations. Hand mixing is not allowed. Add an air entraining agent to all foundation concrete.

704.01.10 Retro-reflective Sheeting.

- A. General.** Furnish the type of retro-reflective sheeting and color specified in the Contract. Meet AASHTO M 268 requirements for the type specified.
- B. Acceptance.** Submit a notarized manufacturer's certification that the retro-reflective sheeting used for each project meets or exceeds Contract requirements.

The Department may take sheeting samples for analysis and testing. The Project Manager may visually compare the sheeting's diffuse day color in the field using standard color charts and test the signs reflectivity using a reflectometer.

Replace rejected material at Contractor expense.

704.01.11 Letters, Symbols, and Accessories.

- A. General.** Furnish the material type(s) specified in the Contract. Use Type A, Type B, or Type C, described as follows.
- B. Type A Letters using Acrylic Plastic Reflectors.**
 - 1. Description.** Furnish Cutout letters, numerals, alphabet accessories, and border strips of embossed aluminum frames with prismatic reflectors installed or affixed as an integral part of the character. Do not use tape or adhesives to affix the reflectors.
 - 2. Design and fabrication.** Use the Federal Standard Alphabet Series "D" or "E modified" for character sizes, series, and spacing. Fabricate characters, borders, and accessory frames from minimum 0.040-inch (1.01 mm) thick sheet aluminum. Drill mounting holes in the frames for attaching to the sign panel. Size and space reflectors to provide maximum night legibility and visibility to the finished figure. The Project Manager will conduct a night inspection for legibility and visibility.
 - 3. Frame Finishing.** Once metal fabrication is complete, de-grease, etch, neutralize, and treat the frame for painting following the paint manufacturer's recommendation. Paint the frames the specified color

with a quality metal enamel following the paint manufacturer's recommendations. White reflective sheeting meeting Subsection 704.01.10 may be used in place of painting.

4. **Acrylic Plastic Reflector.** Use acrylic plastic reflectors meeting AASHTO M 290 requirements.

C. Type B Letters—Removable.

1. **General.** Provide letters, numerals, symbols, and borders that are adhesive-coated reflective sheeting permanently adhered to die cut aluminum backing. De-grease, etch, and treat the aluminum with a light, tight amorphorous chromate type coating. Use Type III white reflective sheeting. Letter and number design is Federal Standard Alphabet Series "E modified".
2. **Fabrication.** Fabricate letters, numerals, and symbols from minimum 0.040-inch (1.01 mm) thick 3003 H 14 alloy aluminum sheeting. Fabricate borders from 0.032-inch (0.81 mm) thick AA6062 T 6 alloy aluminum sheeting. Prepare the aluminum sheeting and apply the reflective sheeting following the reflective sheeting manufacturer's recommendations. All pieces must have an embossed height of approximately 1/8-inch (3 mm).

Space mounting holes for screws, bolts, or rivets no more than 8-inches (205 mm) on center; determined by the character size and shape. Edge-seal completed pieces following the reflective sheeting manufacturer's recommendations.

D. Type C Letters—Direct Applied.

1. **Sheeting.** Furnish letters, numerals, symbols, and borders from Type III sheeting, permanently adhered to the sign face reflective sheeting.
2. **Fabrication.** Apply the letters, numerals, symbols, and borders following the sheeting manufacturer's recommendations. Follow the size, series, and spacings in the Federal Highway Administration's Standard Alphabets proportion and spacing requirements.

Assure the finished pieces are clean cut, free of ragged borders.

704.01.12 Paints. Use paints meeting Section 710 requirements.

704.01.13 Hardware. Use bolts, washers, nuts, lock washers, incidental hardware, and angles for erecting aluminum sheet and plywood signs that are:

- A. Galvanized meeting ASTM A 153 or ASTM A 164 specifications; or
- B. Cadmium-plated steel meeting ASTM A 165; or
- C. Aluminum alloy meeting ASTM B 211 for alloy 2024-T4.

704.02 FABRICATION OF SIGNS.

704.02.1 Aluminum Signs. Provide a reflectorized sheet background. Clean rust, white rust, oil, and dirt from the aluminum sheeting. De-grease the sheeting using vapor or alkaline de-greasing agent following the de-greasing agent manufacturer's recommendations. De-grease, acid or alkaline etch, rinse, and dry the sheeting as recommended by the etching solution manufacturer.

Treat the etched sheeting with a light, tight adherent chromate conversion coating before applying the reflective sheeting. This coating must not leave a powdery residue and may leave a silvery iridescence to pale yellow appearance. Coat meeting ASTM B-499, Class 2, 10 to 35 milligrams thick per square foot (0.093 m²). Hot air dry the sheeting once coated. Apply and seal the reflectorized sheeting on the prepared aluminum sheeting following the reflective sheeting manufacturers recommendations. Meet the applicable requirements of Subsection 704.01.11 for legend and borders.

Color the blind rivet heads to match the sign face. Apply background material to the sheet aluminum before fabricating the sign. Butt the sheet increments together to produce a joint that meets the specified tolerances limits.

Do not use water to float the reflective sheeting or legends into place during fabrication.

704.02.2 Plywood Signs. Provide a reflective background. Seal all wood edges, including interior joints, before fabrication using one coat of exterior aluminum paint followed by one coat of enamel, colored to match the reflective background sheeting. Apply the reflective sheeting and seal the edges following the sheeting manufacturer's recommendations.

A. Screen-Processed Legend and Borders. Screen process or reverse-screen process the legend and borders on reflectorized backgrounds meeting the Contract requirements. Use the process and paints recommended by the sheet manufacturer.

B. Reflective Sheeting Legend and Borders. Cut the legend and borders from Type III sheeting.

Do not splice legend characters. Apply legends following the sheeting manufacturer's recommendations. Do not use water to float the reflective sheeting or legend into place during fabrication.

C. Demountable Reflective Legend and Borders. Fabricate demountable legend meeting Subsection 704.01.11 requirements. Furnish the letter type specified in the Contract. Letters cannot be spliced. Make borders and median sections in the longest pieces possible. Butt all joints with no overlap.

704.02.3 Inspection and Acceptance. Completed signs will be inspected where fabricated for acceptance. Signs will be rejected for defects including, but not limited to cracks, tears, splits, crazing, gouges and curled edges of background sheeting or legends.